

Expressions Containing Several Radical Terms

Adding, Subtracting Radical Expressions

Like Radicals: Radicals with the same index and the same radicand are like radicals.

$$\sqrt{3} \quad 2\sqrt{3} \quad \sqrt[5]{7} \quad -3\sqrt[5]{7}$$

To add or subtract radical expressions (pg. 461 - 462)

Simplify the radicals --- then add or subtract

Examples: simplify by combining like radical terms.

$$\sqrt{3} + 2\sqrt{3} \quad \sqrt[5]{7} - 3\sqrt[5]{7} \quad 6\sqrt{7} + 4\sqrt{7} \quad \sqrt[3]{2} - 7x\sqrt[3]{2} + 5\sqrt[3]{2}$$

$$3\sqrt{8} - 5\sqrt{2} \quad 9\sqrt{5} - 4\sqrt{3} \quad \sqrt[3]{2x^6y^4} + 7\sqrt[3]{2y}$$

$$\sqrt{27} + 2\sqrt{12} \quad 5\sqrt[5]{63} - 3\sqrt[5]{28}$$

Products and Quotients of Two or More Radical Terms (pg. 462 – 463):

Radical expressions often contain factors that have more than one term. Multiplying such expressions is similar to finding products of polynomials. **Multiplying radicals** – use the same properties used to multiply polynomial expressions.

$$\sqrt{3}(x - \sqrt{5}) \quad \sqrt[3]{y}(\sqrt[3]{y^2} + \sqrt[3]{2}) \quad (4\sqrt{3} + \sqrt{2})(\sqrt{3} - 5\sqrt{2})$$

$$(\sqrt{a} + \sqrt{b})^2 \quad (\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b})$$

Rationalizing Denominators or Numerators with Two terms (pg. 463 – 464): To rationalize a numerator or denominator that is a sum or difference of two terms we use **conjugates**

$$(a + b)(a - b) = a^2 - b^2$$

These two expressions are called conjugates of each other.

Examples:

Rationalize each denominator

$$\frac{4}{\sqrt{3} + x}$$

$$\frac{4 + \sqrt{2}}{\sqrt{5} - \sqrt{2}}$$

Rationalize the numerator

$$\frac{4 + \sqrt{2}}{\sqrt{5} - \sqrt{2}}$$

To Simplify Products or Quotients with Differing Indices (pg. 465)

1. Convert all radical expressions to exponential notation.
2. When the bases are identical, subtract exponents to divide and add exponents to multiply. This may require finding a common denominator.
3. Convert back to radical notation and, if possible, simplify.

Examples:

Multiply and simplify

$$\sqrt{x^3} \cdot \sqrt[3]{x}$$

$$\text{If } f(x) = \sqrt[3]{x^2} \text{ and } g(x) = \sqrt{x} + \sqrt[4]{x}$$

$$\text{Find } (f \cdot g)(x)$$

Divide, and if possible, simplify

$$\frac{\sqrt[3]{a^2b^4}}{\sqrt{ab}}$$